Public Works Authority Apply Sustainable Developments Concept with Sewerage Works, Qatar

Khaled El Emadi, Ghazi Abdel Kerim, Hassan El Emadi
Outlines

- Objective.
- TSE Reuse Quality Standards.
- Tertiary Treatment Processes.
- Sewage Treatment Works Projects.
- Developments of Monitoring Programs.
- Current TSE Rate & Reuse Applications.
- TSE Reuse in Construction Works (Case Study).
- TSE Advanced Treatment Pilot Feasibility Study.
- Recommendations.
Water Scarcity
Water is Source of Life
Successfully & Healthy Human Life
Sustainable Water Resources Development in Gulf Area
During the UN Sustainable Development Decade (2005–2015), PWA is managing consultancy and contracting services to design, build and operate state-of-the-art, sustainable world-class infrastructures for sanitary drainage works that not only achieve environmental protection, but also to sustain the environment, increase non-conventional water resources, protect assets for the coming generation, as well as fulfill the Qatar Vision 2030.
Treated Sewage Effluent Reuse Quality Standards

International:
Microbiological Quality for Wastewater Reuse:
WHO guidelines
US EPA recommendations
Other countries such as Italy, Cyprus and Andalusia guidelines

Chemical Quality and Agronomical Aspects for Wastewater Reuse:
The Food & Agriculture Organization (FAO) guidelines

Local: Qatar Environmental Law No. 30, year 2002.
Regional: Gulf Countries Such as Saudi Arabia, UAE, etc.

PWA Proposed Design Standards.
### Table (1) Proposed Standard Sewage Treated Effluent For Reuse

<table>
<thead>
<tr>
<th>Standard Effluent Criteria</th>
<th>Proposed Standard</th>
<th>Future Standard</th>
<th>Basis of Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspended Solids</td>
<td>5 mg/l</td>
<td>5 mg/l</td>
<td>90%</td>
</tr>
<tr>
<td>BOD</td>
<td>5 mg/l</td>
<td>5 mg/l</td>
<td>90%</td>
</tr>
<tr>
<td>COD</td>
<td>50 mg/l</td>
<td>50 mg/l</td>
<td>90%</td>
</tr>
<tr>
<td>pH</td>
<td>6 – 9</td>
<td>6 - 9</td>
<td>90%</td>
</tr>
<tr>
<td>Ammonia</td>
<td>1 mg/l</td>
<td>1 mg/l</td>
<td>90%</td>
</tr>
<tr>
<td>Phosphate</td>
<td>*1/2 mg/l</td>
<td>2 mg/l</td>
<td>90%</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>10 mg/l</td>
<td>5 mg/l</td>
<td>90%</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>2 mg/l (min)</td>
<td>2 mg/l (min)</td>
<td>90%</td>
</tr>
<tr>
<td>Chlorine (Free Residual)</td>
<td>0.5 – 1.0 mg/l</td>
<td>0.5 – 1.0 mg/l</td>
<td>90%</td>
</tr>
<tr>
<td>Turbidity</td>
<td>2 NTU</td>
<td>2 NTU</td>
<td>90%</td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td>2000 mg/l</td>
<td>500 mg/l</td>
<td>90%</td>
</tr>
<tr>
<td>MPN of Faecal Coliform per 100 ml</td>
<td>0.0</td>
<td>0.0</td>
<td>90%</td>
</tr>
<tr>
<td>Intestinal nematodes (no. of eggs per 1 litre)</td>
<td>&lt; 1.0</td>
<td>0.0</td>
<td>95%</td>
</tr>
<tr>
<td>Enteric Viruses (no. of plaque forming unit (PFU) per 40 liters )</td>
<td>&lt; 1.0</td>
<td>&lt;1.0</td>
<td>90%</td>
</tr>
<tr>
<td>Guardia (no. of cysts per 40 liters)</td>
<td>&lt; 1.0</td>
<td>&lt;1.0</td>
<td>90%</td>
</tr>
</tbody>
</table>

*Phosphate limit is based on applied treatment technology (Chemical/Biological).*
Existing & Under Development

STWs

Note: Duplicate this slide for the next & previous photo.
### Table (3) PWA Sewage Treatment Works Projects

<table>
<thead>
<tr>
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<td>Sailiyah</td>
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<td>175000</td>
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<td>180000</td>
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<td>Industrial Area</td>
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<td>24000</td>
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<tr>
<td>Al Khore</td>
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<td>5000</td>
<td>2016</td>
<td>10000</td>
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<td>10000</td>
<td>2016</td>
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<tr>
<td>Al Dhakhirah</td>
<td>2008</td>
<td>1600</td>
<td>2013</td>
<td>3200</td>
<td>2019</td>
<td>42000</td>
<td>2030</td>
<td>56000</td>
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<tr>
<td>Doha North</td>
<td>2013</td>
<td>243000</td>
<td>2016</td>
<td>324000</td>
<td>2016</td>
<td>324000</td>
<td>2016</td>
<td>324000</td>
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<tr>
<td>Al Shamal</td>
<td>2013</td>
<td>150</td>
<td>2013</td>
<td>750</td>
<td>2015</td>
<td>7500</td>
<td>2030</td>
<td>22500</td>
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<td>Shahaniyah</td>
<td>2013</td>
<td>810</td>
<td>2013</td>
<td>1350</td>
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<td>1350</td>
<td>2013</td>
<td>1350</td>
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<tr>
<td>Al Khareeb</td>
<td>2005</td>
<td>60</td>
<td></td>
<td></td>
<td>2005</td>
<td>60</td>
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<tr>
<td>Aum Silal</td>
<td>2006</td>
<td>1500</td>
<td></td>
<td></td>
<td>2006</td>
<td>1500</td>
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<tr>
<td><strong>Total</strong></td>
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Note: Duplicate this slide for the next & previous photo.
Doha West STW
Development & Extension of Sanitary Sewerage & TSE Network STWs

Sanitary Sewerage

TSE Networks

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Distribution of Drainage Services per Population

Qatar 2009 (1638829)  
Qatar 2020 (3208963)
Developments of Monitoring Programs

At 2004, monitoring was only by one identity such as laboratory belonging to PWA quality section.

At 2006, PWA initiated evaluation tools of local private laboratories & announced yearly approved private laboratories List.

At 2007, PWA developed professional contracts with private drainage operator’s contractors to take over the responsibility towards operation and maintenance as well as self monitoring.

At 2008, monitoring was extended to be by not only PWA laboratory quality section but also by operator’s contractors & approved private laboratories.

At 2010, PWA applied remote monitoring system based on YSI sonde, Network Interface Module with built-in GSM/GPRS cellular modem, to support PWA by real time quality reports.
Industrial Area
STWs

**Inlet**
Set-up:
New Auto sampler
+ 2150 flow meter +
New YSI sonde +
2105 Network Interface
Industrial Area Preliminary Treated Flow Weekly Report

- Level: 1464.98 mm
- Flow Rate: 43774.3 m³
- Velocity: 0.391 m/s
- Total Flow: 48784.6 m³

Graph showing data from 18 Mon to 24 Sun, July 2011.
Industrial Area Preliminary Treated Water Quality Weekly Report

**INDUSTRIAL WWTP INLET**
Flowlink 5

- Temperature: 30.40 °C
- T.D.S.O: 650.00 ppm
- Conductivity: 1102.00 µS/cm
- Turbidity: 82.50 NTU
- pH: 7.82

![Graph showing temperature, conductivity, turbidity, and pH over time from July 17 to July 24, 2011.](image-url)
Current Treated Effluent Reuse Applications
Current Treated Effluent Rate & Distribution

- Crude Sewage
- TSE
- Reuse
- Disposal

GW Injection: 37
Lagoon: 27
Animal fodder Irrigation: 25
End User & Highway Irrigation: 11

Graph showing treated effluent rates from February 2008 to February 2012.
TSE Use in Construction works in Doha North STW Project (case study),
Al Dahkhirah STW
Add UF + RO+
Tanker filling line
1250 m$^3$/d feed water.
600 m$^3$/d product water.
POTABLOC PLANT MONTHLY TSE DEMAND VS MONTHLY PRODUCTION OF RO WATER
RO Product Water Distribution for DNSTW Project

- Concrete Production: 40%
- Dust Control: 24%
- Landscaping: 32%
- Other Purpose: 4%
- Other Purpose: 4%
Reverse Osmosis (RO) Pilot Feasibility Study, Qatar

Pilot Plant Implementation, Doha West STWs, (40m3/hr) to find out the feasibility of application of RO in full scale STWs to improve the quality of PWA TSE and extend TSE use in different applications.
Recommendations

Extend TSE Reuse To Reduce Desalinated water consumption in: non potable use Applications

Construction Projects, Sand Washing, District Cooling, Concrete Batch Plants, Landscaping, Farms Irrigations, Aqua farm, Recreation.

Inject Excess TSE into GW Aquifer
Thank You
Any Questions

gabdulkareem2@ashghal.gov.qa